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Creepy Critters

Robert McCaw

A star of Creepy Critters: Boris the Spider

If Little Miss Muffett had visited *Creepy Critters* at the Canadian Museum of Nature, she might have been able to finish her lunch. And she wouldn't have passed on her fears to generations of adults ... at least according to the latest theories on animal phobias.

Dr. Jovan Simeon, a child psychiatrist at the Royal Ottawa Hospital, explains that most fears of small animals are learned in childhood. The nursery rhymes, television shows, family and friends encountered by children teach them to be afraid of spiders and other small creatures. By the time a fearful person reaches adulthood, these fears can be deeply ingrained. And, in a small number of people, these fears can develop into disabling phobias.

"At first, a person with a phobia of an animal deals with that fear by avoiding that animal. This avoidance behaviour becomes a problem when trying to avoid the animal results in interference with the person's social, school or work life," explains Dr. Simeon. If the sight of a spider makes the hair on your neck stand up you may simply be fearful. But, if fear of encountering a spider keeps you from going into your backyard, you may be suffering from a phobia.

Only an estimated two per cent of the population suffers from disabling phobias. But, of these people, a large number are afraid of small animals like toads, spiders and insects. Psychiatrists give three reasons why small animals rank near the top of the phobia list: these animals are perceived as unpredictable and uncontrollable, and they are unknown.

Fortunately, most small animal phobias are easy to treat. The treatment, called desensitization, involves gradual exposure to the feared animal. For example, suppose a child has arachnophobia, a fear of spiders. After learning about the child and the child's phobia, the therapist will ask the patient simply to think about the animal. In later therapy sessions, the therapist will ask the patient to look at drawings, photographs and videos of the feared animal. Eventually, the therapy will conclude with exposure to the feared animal.

Although few of us suffer from disabling phobias, many of us can deal with our mild phobias of small animals by learning more about these creatures. "Knowledge goes a long way to overcoming fears. By learning the facts, seeing the animal up close, and eventually touching the animal, a person can overcome fear of that animal. That's why *Creepy Critters* is an ideal place to overcome fears," suggests Dr. Simeon. Dr. Simeon has told phobic children to visit the exhibit.

Until March 31, 1992, *Creepy Critters* will acquaint you with 13 of the most misunderstood animals. Live snakes, spiders, cockroaches, leeches, slugs and others will reveal the truth about their behaviour, anatomy and ecological roles. Text, videos, audio presentations, models and other media will help you learn to separate myth from reality. Movie clips starring unloved creatures, computer games, a reading area and many related activities round out the exhibit.

For those of you who are determined to face your fears, be sure to participate in the live programming scheduled daily. You might have the opportunity to touch a 12-cm-long slug, stroke a 6-cm-long hissing cockroach or take a closer look at Hervé the Rat Snake — once held by the obviously non-phobic Raisa Gorbachev.

If you are phobic, merely fearful or simply interested in our world's little creatures, don't miss this exhibit. Whether you admire a slug from afar, sneak a peek at a snake or touch a toad, you will leave *Creepy Critters* with a little more knowledge about what lies beneath the slime, under the scales, inside the warts ... and behind your fears.

Tamara Tarasoff
Exhibits Division

A Rose By Any Other Name...

Part 2: How Plants and Animals Get Their Names

Anyone who has walked through a meadow or down a forest path cannot help but be impressed by the variety of living things all around. There are different kinds of trees, dozens of flowers of various colours and shapes, hundreds of insects of every description and many kinds of animals feeding or sunning or hiding. The air is filled with the sounds of birds. "And," we say to ourselves, "every living creature has a name." It turns out that this statement is truer in some places than it is in others, and it's truer with some organisms than it is with others.

Most plants and animals do, in fact, have a name ... and often more than one. There is a graceful, white-flowered shrubby tree in Canada that is called "serviceberry" or "shadbush" or "Juneberry" in Ontario, but is called "petites poires" in Quebec. In fact, "common" or vernacular names are often different in different parts of the world because of local uses and traditions. For scientific purposes, it is obviously much better to have one name for each organism so that people all over the world can discuss the same organism with the same name. Our pretty "shadbush" has only one scientific name: *Amelanchier humilis*.

In the mid-1700s, a Swedish naturalist and physician, Carl von Linné (or Linnaeus), came up with a neat way of naming plants and animals. Until then, plants and animals had only descriptive names, and some were pretty long (something like, "the pinkish rose with a long stem and spines along the leaf margins"). Linnaeus decided to make all the names of plants and animals two words long. The first word would be the *genus* name, and the second would be the *species* name. Each genus could have one or many species. When someone uses the two-word name, it will refer back to a published description of that plant or animal. Linnaeus then went on to name every plant and animal that he knew in the entire world! An example would be *Acer*, the genus of maple trees. There are many kinds of maples: *Acer saccharum*, the sugar maple (the leaf on the Canadian flag); *Acer rubrum*, the red maple; *Acer negundo*, the Manitoba maple; and so on.

The scientific names of living things are in Latin or at least are latinized. Latin used to be the universal language of scholars and scientists, and was much more widely understood than Swedish, German, French or English. The tradition stuck, and we still use Latin names to be

(continued on page 4)

NOV - 6 1990
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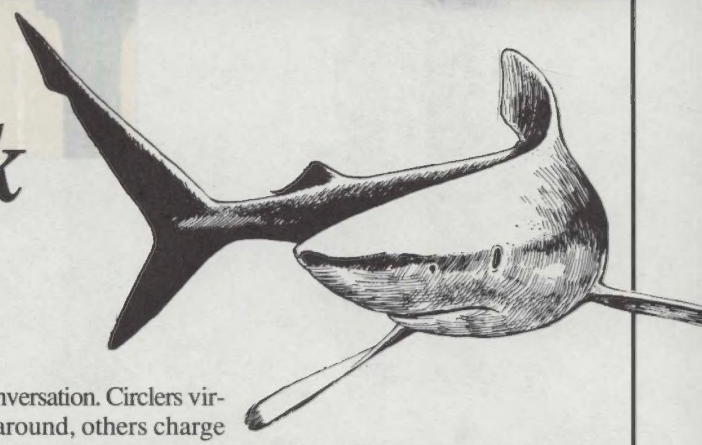
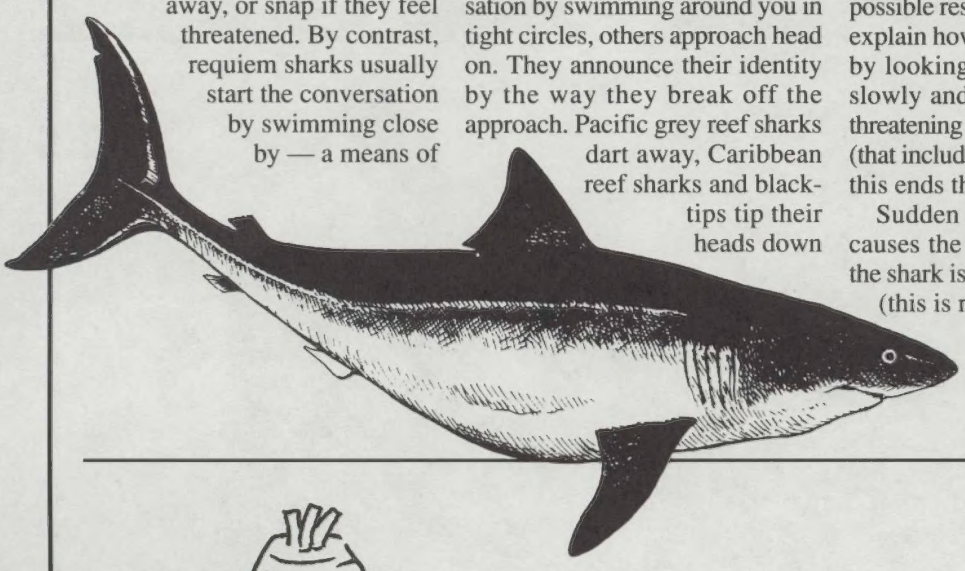
From the Director's Desk:

Research on Shark Conversations



I often talk to sharks, and they to me: a silent conversation, communicating with our bodies. Each species of shark (about 350) has a different language and ability to communicate among themselves and with other creatures.

Coral reef sharks are often human-sized, accustomed to communicating with each other, and with other species. But what do you say to a shark? It depends on the species. Some (nurse sharks, cat sharks) are interested only in avoiding contact. They just move away, or snap if they feel threatened. By contrast, requiem sharks usually start the conversation by swimming close by — a means of asking who or what you are. If you make an interesting response, they will return. Some, like Pacific blacktips, will carry on the conversation by swimming around you in tight circles, others approach head on. They announce their identity by the way they break off the approach. Pacific grey reef sharks dart away, Caribbean reef sharks and blacktips tip their heads down and swim low, and bull sharks move away slowly, showing their sides.



How do you respond? This early in the encounter, there are many possible responses. The safest is to explain how uninteresting you are by looking small, moving away slowly and generally making no threatening or intimidating motions (that includes staring!). Most times this ends the conversation.

Sudden moves or lashing out causes the shark to dart away. If the shark is sufficiently threatened (this is rare), it will not return. If it returns, it will frantically ask you to leave. This is the most important part of the conversation. Circlers virtually whiz around, others charge and break off at the last second, some dart around in a very confusing manner. If you are smart, you will immediately make yourself completely submissive (keep all arms and legs close to your body, no sudden moves, no staring — but don't let them out of your sight). Move slowly a long way away, or out of the water if the sharks continue to follow.

By confronting the shark with more threats, it is sometimes possible to chase it off. If you do not succeed, you have upped the ante considerably: bite, flee or be bitten. Even at this stage, however, some species will announce their intentions. The Pacific grey reef shark has an elaborate series of signals, beginning with exaggerated swimming, its head shaking. The Caribbean reef shark raises its head. The Pacific silvertip shivers its tail. Immediately following these signals is a charge and bite so rapid that no human could avoid it. Sharks can be killed, but we should never have to kill a shark — or any other animal — because we provoked an attack.

Alan R. Emery
Director

A Garden from Your Kitchen

Have you ever opened your kitchen cupboard or refrigerator only to find that your vegetables have healthier roots and greenery than they ever did when you tried to grow them in your garden? Is your thumb definitely not "green"? Why not take advantage of these sprouting or limp vegetables by starting a dish garden!

What You Will Need

A decorative dish or pan about 10 cm deep
Aquarium gravel
Water
Any or all of the following: radish, carrot, white turnip, sweet potato, potato

Method

Wash the aquarium gravel a few times until the water is clear. Put enough gravel into the dish to make a layer about 5 cm deep and then add enough water to barely cover the stones.

Cut carrots 5 cm from the top. For turnips, radishes and potatoes, cut away about one-third from the bottom.

Place your vegetables cut-side down on the surface of the gravel. If any of them lean, just shift the stones a little to help support them.

Place the dish in a sunny window and add water regularly to maintain the water level at the surface of the gravel. That's all you need to do!

If you want to be creative, select a variety of vegetables to create an artistic array of greenery. The carrot stalks will fall over after reaching a certain height, the way ferns do. The turnip will provide an erect stalk about 25 to 30 cm tall, and the radish greens will grow to about 15 cm. The sweet potato will take a little longer to sprout roots and leaves, but if you are patient, you will be rewarded with an attractive vine more than a metre in length (you may wish to eventually transfer this plant to a pot of soil.)

When the plants become overgrown or are no longer attractive, simply look in your cupboard or refrigerator and start over again.

Other plants can be grown from items in your kitchen. Herbs such as coriander can be grown from the seed, garlic from a clove of garlic, ginger from fresh ginger, and avocado from the pit. These grow best in soil and require a little more care. You'll find the avocado takes a long time to root and sprout, but your patience will be rewarded with an avocado tree that can last for years.

For information on how to grow any of these plants, write to the Museum's Education Division.

Mary Anne Dancey
Education Division

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Editor-in-Chief:
Nick Bélanger

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Graphic Design:
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Illustrations:
Laurie Consaul
Charles Douglas
Chris Jackson
Michael Leveille
Sandra Taylor

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Comments and questions should be directed to:

BIOME
Canadian Museum of Nature
P.O. Box 3443
Station D
Ottawa, Ontario
K1P 6P4

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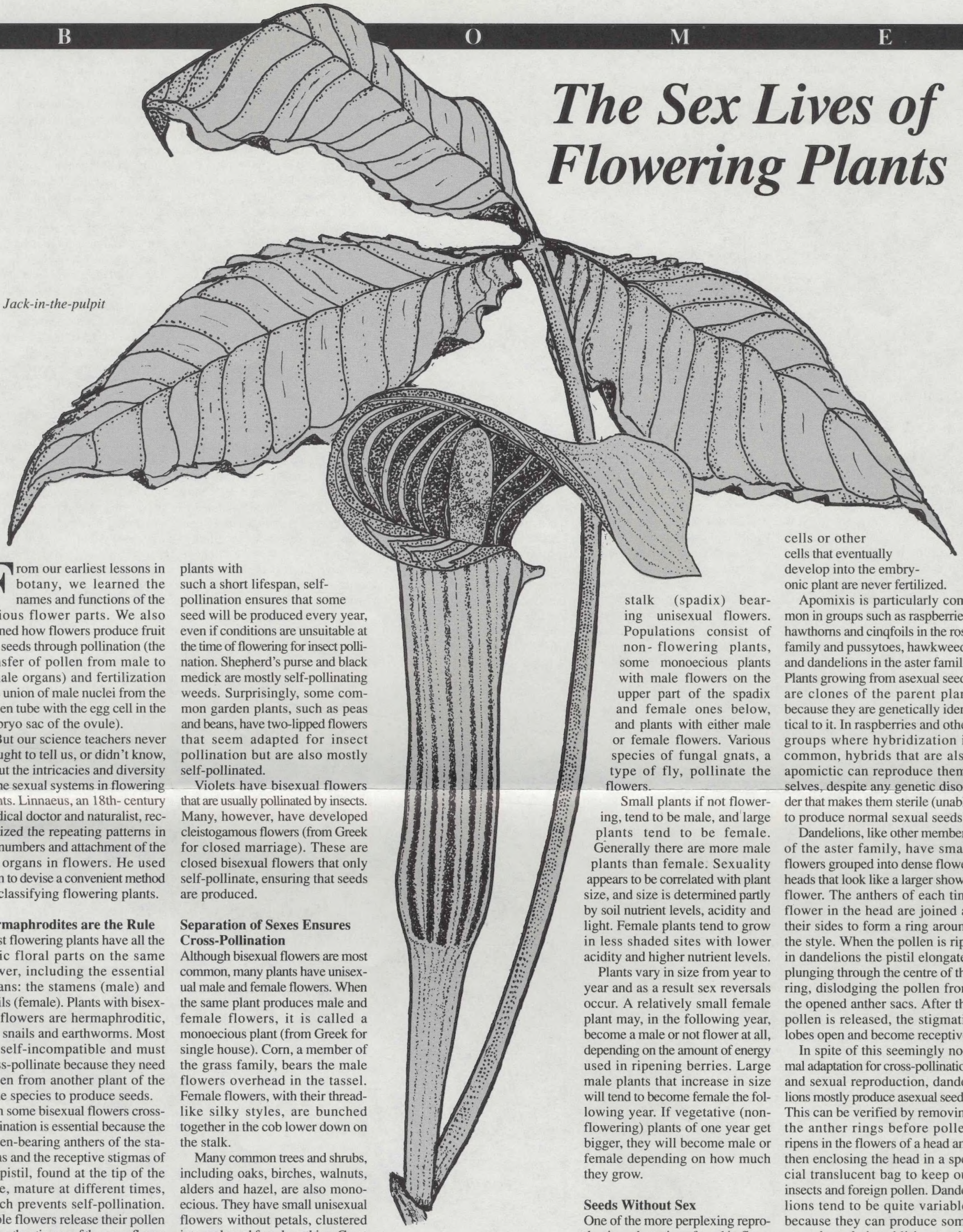
The Sex Lives of Flowering Plants



Jack-in-the-pulpit

From our earliest lessons in botany, we learned the names and functions of the various flower parts. We also learned how flowers produce fruit and seeds through pollination (the transfer of pollen from male to female organs) and fertilization (the union of male nuclei from the pollen tube with the egg cell in the embryo sac of the ovule).

But our science teachers never thought to tell us, or didn't know, about the intricacies and diversity of the sexual systems in flowering plants. Linnaeus, an 18th- century medical doctor and naturalist, recognized the repeating patterns in the numbers and attachment of the sex organs in flowers. He used them to devise a convenient method for classifying flowering plants.

Hermaphrodites are the Rule

Most flowering plants have all the basic floral parts on the same flower, including the essential organs: the stamens (male) and pistils (female). Plants with bisexual flowers are hermaphroditic, like snails and earthworms. Most are self-incompatible and must cross-pollinate because they need pollen from another plant of the same species to produce seeds.

In some bisexual flowers cross-pollination is essential because the pollen-bearing anthers of the stamens and the receptive stigmas of the pistil, found at the tip of the style, mature at different times, which prevents self-pollination. Apple flowers release their pollen before the stigmas of the same flower are receptive. Bees carry the pollen from one flower to another more mature flower where the stigmas are ready to receive pollen. In magnolias the reverse is true — stigmas mature before the anthers. The end result is that cross-pollination promotes greater genetic variability, which makes the species more adaptable to changing conditions.

Self-Pollination Ensures Seed Set

Many annuals, biennials and short-lived perennials (plants that live for one, two or several years), especially among common roadside weeds, are self-compatible. For plants with such a short lifespan, self-pollination ensures that some seed will be produced every year, even if conditions are unsuitable at the time of flowering for insect pollination. Shepherd's purse and black medick are mostly self-pollinating weeds. Surprisingly, some common garden plants, such as peas and beans, have two-lipped flowers that seem adapted for insect pollination but are also mostly self-pollinated.

Violets have bisexual flowers that are usually pollinated by insects. Many, however, have developed cleistogamous flowers (from Greek for closed marriage). These are closed bisexual flowers that only self-pollinate, ensuring that seeds are produced.

Separation of Sexes Ensures Cross-Pollination

Although bisexual flowers are most common, many plants have unisexual male and female flowers. When the same plant produces male and female flowers, it is called a monoecious plant (from Greek for single house). Corn, a member of the grass family, bears the male flowers overhead in the tassel. Female flowers, with their thread-like silky styles, are bunched together in the cob lower down on the stalk.

Many common trees and shrubs, including oaks, birches, walnuts, alders and hazel, are also monoecious. They have small unisexual flowers without petals, clustered into male and female catkins. Great quantities of fine pollen released by the male flowers are carried by the wind and trapped by the plume-like stigmas of the female flowers. Willows and poplars produce male and female catkins on separate plants. These are dioecious plants (from Greek for two houses).

Sex Reversals

Except for Manitoba maple, which also has separate male and female trees, plant sexuality in maples is generally more complex than in plants with bisexual or unisexual flowers. Maples have bisexual flowers mixed with unisexual ones, all on a single tree. In spite of this, most trees are either male or female. However, some female trees produce a few male flowers, some male trees may ripen a few fruit and some trees change sexes in successive years. Scientists do not really understand why these sex reversals happen.

Jack-in-the-pulpit is a common perennial herb of eastern North American woodlands. It is an arum that has, like other members in the family, a characteristic inflorescence (flower cluster). This cluster consists of a greenish or variously tinted showy spathe that encloses and forms a hood over an upright stalk (spadix) bearing unisexual flowers. Populations consist of non- flowering plants, some monoecious plants with male flowers on the upper part of the spadix and female ones below, and plants with either male or female flowers. Various species of fungal gnats, a type of fly, pollinate the flowers.

Small plants if not flowering, tend to be male, and large plants tend to be female. Generally there are more male plants than female. Sexuality appears to be correlated with plant size, and size is determined partly by soil nutrient levels, acidity and light. Female plants tend to grow in less shaded sites with lower acidity and higher nutrient levels.

Plants vary in size from year to year and as a result sex reversals occur. A relatively small female plant may, in the following year, become a male or not flower at all, depending on the amount of energy used in ripening berries. Large male plants that increase in size will tend to become female the following year. If vegetative (non-flowering) plants of one year get bigger, they will become male or female depending on how much they grow.

Seeds Without Sex

One of the more perplexing reproductive adaptations found in flowering plants is apomixis, meaning without mixing (uniting sex cells). Apomixis is any asexual means of reproduction, such as bulbil formation in lilies and saxifrages. These bulbils are small bulb-like or berry-like structures, often formed in the flower clusters, that can root and form new plants. However, the term apomixis is used mostly when referring to the formation of asexual seeds with embryos derived from egg cells, or other cells in the ovules (immature seeds). The embryos in these seeds have chromosomes that are identical to the parent plant in number and in the genes present. The egg cells or other cells that eventually develop into the embryonic plant are never fertilized.

Apomixis is particularly common in groups such as raspberries, hawthorns and cinqfoils in the rose family and pussytoes, hawkweeds and dandelions in the aster family. Plants growing from asexual seeds are clones of the parent plant because they are genetically identical to it. In raspberries and other groups where hybridization is common, hybrids that are also apomictic can reproduce themselves, despite any genetic disorder that makes them sterile (unable to produce normal sexual seeds).

Dandelions, like other members of the aster family, have small flowers grouped into dense flower heads that look like a larger showy flower. The anthers of each tiny flower in the head are joined at their sides to form a ring around the style. When the pollen is ripe in dandelions the pistil elongates plunging through the centre of the ring, dislodging the pollen from the opened anther sacs. After the pollen is released, the stigmatic lobes open and become receptive.

In spite of this seemingly normal adaptation for cross-pollination and sexual reproduction, dandelions mostly produce asexual seeds. This can be verified by removing the anther rings before pollen ripens in the flowers of a head and then enclosing the head in a special translucent bag to keep out insects and foreign pollen. Dandelions tend to be quite variable, because they can produce some sexual seeds in addition to the asexual ones. Plants growing from these sexually produced seeds may exhibit some new morphological traits. These will be reproduced, unchanged, generation after generation by the asexual seeds. The plants so produced are identical clones of the parent plants.

This brief account of flower sexuality has dealt with only a few aspects of the subject. There are other interesting and bizarre adaptations of flowers to their pollinators — but that's another story.

Erich Haber
Botany Division

Finding something new can be a joy ...

ROSE BY ANY OTHER NAME...

(continued from page 1)

more "international," even though few scientists these days get much training (if any) in Latin.

Does every living thing have a Latin name? Far from it. New species are being discovered every day. In the tropical rain forests, there are thousands of new species of plants and animals waiting to be discovered. A scientist from the Smithsonian Institution found hundreds of new species of insects in the leafy canopy of a single tree in the tropical rain forest!

Scientists and naturalists are seeing and collecting things all the time. How do they know when they are "new"? It isn't easy. I collected a lichen in the Appalachian Mountains that I was sure was new. I was familiar with all the related lichens in North America, and it clearly wasn't any of them. Later, I discovered that someone in Europe had already named the same species of lichen based on collections made in Japan! It was an example of a plant found in both the Appalachian Mountains and eastern Asia. (There are lots more examples.) Fortunately, I caught my mistake before I named it myself. If I had, the lichen would have had *two* names, and the newer one (mine!) would have ended up in the garbage bin of synonymy.

If a very careful review of all the possible sources of an older name are exhausted ... and that involves searching in a lot of very old books and catalogues, as well as scores of old and modern lists of plants from areas near and far ... then we can create a new name.

To name a plant or animal, a scientist must follow a strict set of rules agreed upon by colleagues all over the world, and reviewed periodically. Botanists use one set of rules for naming plants and fungi; zoologists have their own rules for naming animals. Scientists who deal with names and the classification of living things are called taxonomists. At the Canadian Museum of Nature, almost all the scientists are taxonomists of one kind or another. They are familiar with the rules of naming (nomenclature). And, with their library and collections to help them sort the new from the old species, they are well-equipped to reliably name all kinds of organisms.

Finding the right name for an organism is the *last* step in a rather lengthy process. In the case of a flowering plant, for example, it involves seeing and correctly interpreting all kinds of features of the plant; recognizing similarities with other plants; deciding whether the similarities are simply superficial and coincidental or reveal a common ancestry; and within the framework of a classification *system*, determining where in this system the plant belongs. (Taxonomists are also called systematists for that reason.)

In the process of naming organisms, taxonomists sometimes find that the existing classification system is misleading or wrong altogether, and they have to construct a new one. Naming a pretty flower can often lead a taxonomist down a bumpy road, one with lots of curves and confusing forks. Being able to successfully negotiate the road, perhaps finding a new and better route along the way, and arrive at the right destination, is as exciting and satisfying for a taxonomist as it is for a cross-country rally driver.

But suppose we've gone through this whole process and are pretty sure we have something new. Let's see how we would name, for example, a wild orchid in the genus *Orchis*.

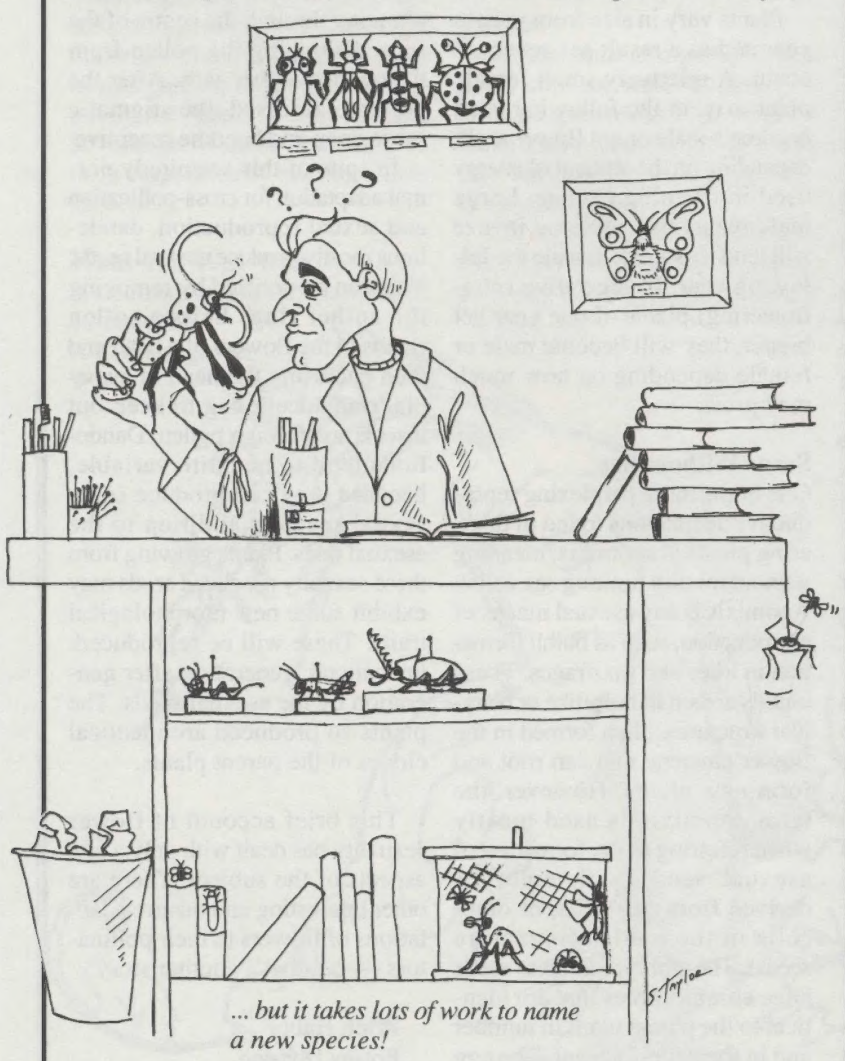
When picking a name, we can use a distinctive feature of the plant (for example, calling it *Orchis rosea* if the flower is pink, or *Orchis monofolia* if it has only one leaf); or refer to its distribution or geographic range, naming it *Orchis californica* for a plant from California; or refer to its habitat, calling it *Orchis aquatica* for something growing in or near the water; or we can name it after somebody living or dead, who may have worked on the genus before (for example, honouring Boris Krashinkowesichov by calling it *Orchis krashinkowesichovii*, although the only one who would be happy about a name like that would be Boris).

Next, we have to write a description of the plant so that others will recognize it. The rules for naming plants state that the description must be in Latin; there is no such rule for naming animals. Modern botanists who are unfamiliar with Latin often write an abbreviated description in Latin, and a longer, more detailed description in some other modern language.

The description, together with the new name, is then published in a widely distributed journal or book. Just photocopying a few copies or including it in a letter to someone isn't enough. When the journal article appears, the name is official. The plant is listed in catalogues and floras with the two-word name and the author of the name. For example, a lichen I recently described from the intertidal zone of the Queen Charlotte Islands is called, "*Caloplaca litoricola* Brodo."

The chances of finding a new species of bird in Canada or Europe is virtually zero, but there are a number of new flowering plants, many new lichens and probably hundreds of new insects, all needing names. If you crave the thrill of naming a new species and you like flowers or fungi, brush up on your Latin. And if you want to keep the odds of finding something new pretty high, you might consider buying an insect net. Good luck!

Irwin M. Brodo
Botany Division



... but it takes lots of work to name a new species!

Another One

Another issue in the *Neotoma* series is now available.

Ever since their discovery, dinosaurs have fascinated human imagination. What was their world like? What roles did they play in it? Richard Day of the Earth Sciences Division (Paleobiology) answers some of these questions in *Window to the Past: The World of Canadian Dinosaurs*. He describes the five major groups of dinosaurs found in western Canada during the Late Cretaceous: duckbilled dinosaurs (hadrosaurs); horned dinosaurs (ceratopsians); armoured dinosaurs (ankylosaurs); bird-mimic dinosaurs (ornithomimids); and the ferocious tyrannosaurs. Other fascinating and less common dinosaurs are also investigated, such as *Troodon*, noted for perhaps being the most intelligent known dinosaur.

Call or write to the Museum Resource Centre for your free copy of *Neotoma* no. 28, *Window to the Past: The World of Canadian Dinosaurs*. A list of our other free materials is also available upon request.